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TITLE: dimmer device for backlight module

BACKGROUND OF THE INVENTION

5 (a) Field of the Invention

The present invention is related to an improved structure of a backlight module ~~dimmer~~ light distributing device, and more particularly to one that effectively ~~distribute~~ distributes ~~lights~~ light from light sources 10 without developing bright ~~band~~ bands and dark ~~band~~ bands.

(b) Description of the Prior Art:

As illustrated in Fig. 1 (A) of the accompanying drawings for an improved structure of a LCD backlight module of the prior art, the backlight module is 15 essentially comprised of a reflector mask 10, multiple light sources 20, a diffuser plate 30, a lower diffuser sheet 40, a prism 50, a reflective polarizing sheet or an upper diffuser sheet 60 and a LCD 70 arranged in sequence from inside out. Wherein, those light sources 20 may be 20 each a light tube in a stripe, U-shape or other ~~continuously~~ continuous curve, and The ~~light~~ sources 20 may be arranged at a proper spacing between the reflector mask 10 and the diffuser plate 30 and the ~~lights~~ light emitted by each of ~~those~~ the light sources 20 provide 25 provides the display effects by on the LCD module. As generally found available in the market, multiple optical films disposed between the diffuser 30 and the LCD module may be comprised of ~~1-3~~ 1-3 diffuser sheets, ~~0-2~~ 0-2 brightness enhancement films and one reflective polarizing 30 sheet with for the purpose of ~~creating~~ diffusion for

~~diffusing the lights light~~ passing through those optical films so as to correct the phenomena of bright ~~band bands~~ and dark ~~band bands~~ formed forming on the LCD module due to the absence of light emitted ~~to where from the space~~ between ~~any abutted adjacent~~ light sources.

Whereas the diffuser plate 30 functions only to help achieve the even diffusion for lights passing through it, it has a limited efficiency in correcting the phenomenon of the bright ~~band bands~~ and the dark ~~band bands~~ observed on the LCD module. To address this, an improvement is made for certain backlight modules by ~~having extended on purpose extending~~ the distance between those ~~light source sources~~ 20 and the diffuser plate 30 ~~in the hope of widening the scope of each of those light sources 20 entering into the diffuser plate 30 in order to increase the areas of the diffuser plate 30 illuminated by the light source 20 to effectuate greater dispersion of the light entering the diffuser plate 30 to thereby achieve the purpose of reducing the dark band bands.~~. However, the structural design for such an improvement not only provides limited effects but also ~~results in that causes the backlight module must to be made thicker to fail thereby making the compact requirements of the LCD module too large.~~.

Furthermore, some other backlight modules ~~seeks seek~~ to provide extinction (dispersion) on the surface of the diffuser plate by printing on the diffuser plate with ink containing SiO₂ or TiO₂ to achieve the purpose of reducing the dark band. Again, ~~the this~~ extinction process not only increases the production cost of the diffuser and the

complexity of the manufacturing process, but also ~~relates~~
to only provides a passive solution to reduce the dark
~~band bands~~ on the LCD since the extinction is created only
after the light lands on the surface of the diffuser.

5 Further improvement as illustrated in Fig. 1(B),
multiple dimmer light distributing devices 12 are provided
on the reflector mask 10 of the backlight module. The
highly reflective surface of the dimmer light distributing
device 12 reflects the light emitted from the light source
10 20 to eliminate the dark band between any abutted light
sources 20. However, the dimmer light distributing 12
integrated with the reflector mask 10 functions only for
the purpose of reflective dimming distribution and fails
to provide a refractive or diffusive dimming distribution
15 function.

SUMMARY OF THE INVENTION

The primary purpose of the present invention is to
provide an improved structure of a dimmer light
20 distributing device to actively and effectively solve the
problems of the significant bright ~~band~~ bands and dark
~~band bands~~ observed with the LCD module of the prior art
to more effectively distribute the lights emitted form the
light sources. To achieve the this purpose, one or more
25 ~~than one dimmer light distributing devices device is are~~
disposed between the ~~spacing between spaced~~ light sources
to evenly diffuse the ~~lights light~~ diffused from both
sides of the light sources towards the diffuser plate
after having been properly refracted and reflected, ~~thus~~
30 to thereby eliminate the dark ~~band bands~~ between any

abutted light sources.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 (A) is a sectional view of the structure of a backlight module of the prior art.

5 Fig. 1 (B) is a sectional view of the structure of another backlight module of the prior art.

Fig. 2 is a sectional view of a backlight module of a first preferred embodiment of the present invention.

10 Fig. 3 is a sectional view of a backlight module of a second preferred embodiment of the present invention.

Fig. 4 is a sectional view of a backlight module of a third preferred embodiment of the present invention.

Fig. 5 is a sectional view of a backlight module of a fourth preferred embodiment of the present invention.

15 Fig. 6 is a sectional view of a backlight module of a fifth preferred embodiment of the present invention.

Fig. 7 is a sectional view of a backlight module of a sixth preferred embodiment of the present invention.

20 Fig. 8 (A) is a sectional view of a backlight module of a seventh preferred embodiment of the present invention.

Fig. 8 (B) is a sectional view of a backlight module of an eighth preferred embodiment of the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 2, a first preferred embodiment of the present invention is ~~essentially comprised of the a~~ backlight module is ~~essentially comprised of having a~~ reflector mask 10, multiple light sources 20, and multiple

optical films including a diffuser plate 30, a lower diffuser sheet 40, a prism 50, a reflective polarizing sheet or an upper diffuser 60 and in combination with a LCD 70 arranged in sequence from inside out. Wherein,
5 those light sources 20 may be each a light tube in a stripe, U-shape or other continuously curve and curved space. The light sources 20 are preferably arranged at a proper spacing between the reflector mask 10 and the lower diffuser sheet and the ~~lights~~ light emitted by each of
10 those light sources 20 provide the display effects by on the LCD.

One or more than one solid or hollow dimmer light distributing device 80 is provided ~~at where in the space~~ between ~~any abutted adjacent~~ light sources 20. In a first
15 preferred embodiment of the present invention as illustrated in Fig. 2, the dimmer light distributing device 80 is made in a structure ~~of stick bounded bonded~~ to the reflector mask 10, or in a second preferred embodiment as illustrated in Fig. 3, an insertion
20 mechanism 100 is provided on the dimmer light distributing device 80 to ~~be incorporated to allow incorporation into~~ either the reflector mask 10 or the mechanism below the reflector mask 10 for the dimmer light distributing device ~~to be so that the dimmer device is firmly secured to in a~~ proper position on the reflector mask 10. The insertion
25 mechanism 100 is provided with a locking pin 91 under ~~at where between~~ the dimmer light distributing device 80 ~~is bounded in order to bond the dimmer device to the~~ reflector mask 10 while a locking hole 11 is provided ~~to~~
30 in the reflector mask 10 in relation to the respectively

locking pin 81 for the ~~dimmer~~ light distributing device 80 and so that the dimmer device 80 can be locked to the reflector mask 10 ~~to lock to each other.~~ Alternatively, an insertion member may be separately provided to lock the 5 ~~dimmer~~ light distributing device 80 and the reflector mask 10 by means of adhesion, insertion or a screw. As illustrated in Fig. 4 for a third preferred embodiment, the insertion mechanism 100 is disposed with a threaded hole 92 ~~82 underlying between where the dimmer light~~
10 ~~distributing~~ device 80 is ~~bounded bonded~~ to the reflector mask 10 while the locking hole 11 is provided on the reflective mask 10 to permit the insertion of a screw 90 to fasten the ~~dimmer~~ light distributing device 80 to either the reflector mask 10 or the mechanism below the
15 reflector mask 10.

Whereas the ~~dimmer~~ light distributing device 80 of the present invention is ~~provide provided~~ between any ~~abutted adjacent~~ light sources 20, the ~~lights~~ light diffused from ~~(from~~ both sides of the light ~~source source~~
20 passing through is properly refracted and reflected by the ~~dimmer~~ light distributing device 80 before being evenly diffused towards the diffuser plate 30 to provide an active means ~~in of~~ eliminating the dark ~~band bands~~ created between ~~abutted adjacent~~ sources for more effectively
25 distributing ~~lights~~ light emitted from the light source.

The ~~dimmer~~ light distributing device 80 may be made of plastic materials including but not limited to Polycarbonate (PC), or Polymethyl methacrylate (PMMA), or
30 Polyethylene Terephthalate (PET) in ~~to~~ a white or

transparent stick structure, or made of transparent plastic materials, e.g. PC or PMMA added with diffusion agent (such as SiO₂ or TiO₂) in a white mat stick structure so to produce the ~~dimmer~~ light distributing device 80 with various refraction effects to allow for the selection of the proper ~~dimmer~~ light distributing device 80 depending on the spacing between the backlight module and the light source sources 20.

Now referring to Fig. 5 for a fourth preferred embodiment of the present invention, wherein, at least one surface of the ~~dimmer~~ light distributing light device 80 is locally or entirely distributed with embossment 83 in a form of V-, U-, or C-shaped cut, or multiple straight lines or curves or combination of both on the surface facing the lower diffuser plate 30 and the light source 20 ~~in the fourth preferred embodiment of the present invention; or as illustrated in Fig. 6 for a fifth preferred embodiment of the present invention, wherein, multiple convex surfaces in various curvatures 84 are disposed. The ~~dimmer~~ light distributing device 80 is formed by a different convex or flat surface for the embossment 83 or the convex surface to create a light converging effect. Alternatively, as illustrated in Fig. 7 for a sixth preferred embodiment of the present invention, various changes in the shape and the distance of the arrangement are feasible employed depending on the size of the light source sources 20 or the length of the spacing between ~~abutted adjacent~~ light sources 20. The shape of the ~~dimmer~~ light distributing device 80 varies depending on the angle of the disposition of the light~~

~~source sources~~ 20 as illustrated in Figs. 8(A) and 8(B) respectively ~~of showing~~ a seventh and an eighth preferred embodiments of the present invention; wherein, either the appearance, size or shape of ~~those dimmer the light~~ 5 ~~distributing~~ devices 80 ~~is are continuously~~ changed so that the ~~lights light~~ emitted from the light ~~source~~ sources 20 can be diffused from the embossment 83 or the convex surface 84 on the diffuser plate 30 to more effectively solve the problem of the significant bright 10 ~~band bands~~ and dark ~~band bands~~ of the LCD ~~module modules~~ of ~~from~~ the prior art. Alternatively, the same effects can be achieved by having at least one surface of the ~~dimmer~~ ~~light distributing~~ device 80 locally or entirely matted, or printed with ink, or distributed with concave and 15 convex points in either round, rectangular, diamond or polygonal form.

The present invention provides an improved structure of a ~~dimmer~~ light distributing device for a LCD module and this application is duly filed for a utility patent 20 pattern. It should be noted that the specification and drawings ~~are provided as one of~~ illustrate the preferred embodiments of the present invention and do not in any way limit the present invention. Therefore, any structure, device, and/or characteristics similar or equivalent to 25 that of the present invention shall be deemed as falling within the scope of the purpose and the claims made by of the present invention.

CLAIMS

I Claim,

1. An improved structure of a dimmer device essentially comprised of a backlight module including a reflector mask, multiple light sources, multiple optical films and a LCD arranged in sequence from inside out; wherein, each light source being made of stripe or U-shape or any other continuously curved light tube, and disposed at a proper spacing at where between the reflector mask and the diffuser plate is characterized by that the backlight module being provided with at least one dimmer device; lights from both sides of the light source being properly refracted and reflected by the dimmer device to evenly diffuse towards the diffuser plate.
- 15 2. An improved structure of a dimmer device as claimed in Claim 1, wherein, the dimmer device is related to a solid stick structure.
- 20 3. An improved structure of a dimmer device as claimed in Claim 1, wherein, the dimmer device is related to a hollow stick structure.
4. An improved structure of a dimmer device as claimed in Claim 1, wherein, the long stick shaped dimmer device is adhered to the reflector mask.
- 25 5. An improved structure of a dimmer device as claimed in Claim 1, an insertion mechanism is provided to the dimmer device for the dimmer device to be incorporated to the reflector mask or a mechanism provided below the reflector mask.

6. An improved structure of a dimmer device as claimed in Claim 5, multiple locking pins are provided on the surface of the insertion mechanism of the dimmer device to be bounded to the reflector mask, and respective locking holes are provided on the reflector mask or on the mechanism disposed below the reflector mask for the dimmer device to be incorporated to the reflector mask.

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7. An improved structure of a dimmer device as claimed in Claim 1, multiple threaded holes are provided on the surface of the insertion mechanism of the dimmer device to be bounded to the reflector mask, and the locking hole is provided on the reflective mask to permit the insertion of a screw to fasten the dimmer device to the reflector mask or the mechanism below the reflector mask.

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8. An improved structure of a dimmer device as claimed in Claim 1, wherein, at least one surface of the dimmer device is embossed.

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9. An improved structure of a dimmer device as claimed in Claim 1, wherein, the embossment is made at least one straight line or curve or the combination of both in a form of V-, U-, or C-shaped cut.

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10. An improved structure of a dimmer device as claimed in Claim 1, at least one surface of the dimmer device is provided with multiple convex surfaces in various curvatures.

30 11. An improved structure of a dimmer device as

claimed in Claim 1, the dimmer device relates to a transparent stick structure.

12. An improved structure of a dimmer device as claimed in Claim 1, the dimmer device relates to a
5 white stick structure.

13. An improved structure of a dimmer device as claimed in Claim 1, the dimmer device relates to a matted stick structure.

14. An improved structure of a dimmer device as
10 claimed in Claim 1, wherein, at least one surface of the dimmer device is locally or entirely treated with ink, matted, or printed, or distributed with concave and convex points in either round, rectangular, diamond or polygonal
15 form.

15. An improved structure of a dimmer device as claimed in Claim 1, wherein, the optical films are comprised of a lower diffuser sheet, a prism and a reflective polarizing sheet.

20 16. An improved structure of a dimmer device as claimed in Claim 1, wherein, the optical films are comprised of 1~3 diffuser sheets, 0~2 brightness enhancement films, and 0~1 reflective polarizing sheet.

25 17. An improved structure of a dimmer device as claimed in Claim 1, wherein, the dimmer device is made of Polycarbonate (PC), or Polymethyl methacrylate (PMMA), or Polyethylene Terephthalate (PET) in to a transparent stick structure.

30 18. An improved structure of a dimmer device as

claimed in Claim 1, wherein, the dimmer device is made of Polycarbonate (PC), or Polymethyl methacrylate (PMMA), or Polyethylene Terephthalate (PET) in to a white stick structure.

5 19. An improved structure of a dimmer device as claimed in Claim 1, wherein, the dimmer device is made of transparent plastic materials including Polycarbonate (PC), or Polymethyl methacrylate (PMMA) added with diffusion agent into a matted

10 stick structure.

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ABSTRACT

At least one dimmer light distribution device is provided at in the spacing between abutted adjacent light sources to allow lights light diffused from both sides of the light sources to be properly refracted and reflect so as to further more evenly diffuse light toward a diffuser plate thus to and thereby, eliminate the dark band bands between abutted adjacent light sources for effectively solving the significantly present bright band bands and dark band bands of the problem observed in prior art LCD modules module observed with the prior art.